Ordering number : EN 2921A

SANYO No.2921A

LA7696

Color TV ON-Screen Display Interface

The LA7696 is a color TV on-screen display interface IC. The R, G, B graphic input signals can be used to provide channel display and the fast blanking input signal can be used to provide black-bordered character, etc. The LA7696 also contains an auto green function to make green color more vivid and a service switch function in a DIP-20 slim-type package.
Input signals are R-Y, G-Y, B-Y, and -Y and output signals are converted to R, G, B primary color signals.

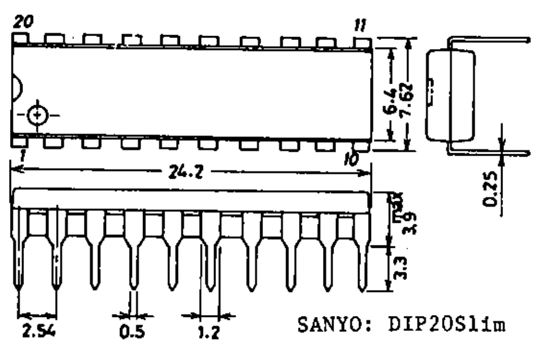
Functions and Features

- The R, G, B graphic input signals can be used to provide on-screen display.
  The R, G, B graphic input signals can be combined to select six colors in addition to white and black.
- Fast blanking function
- The black level and white level can be set separately, as desired, in the graphic mode.
- Output of primary color drive type (input: R-Y, G-Y, B-Y, -Y)
- Excellent frequency characteristic allowing the LA7696 to be used in a high-resolution TV
- Auto green function
  Bluish green turns more vivid green.
- Service switch function
  It is easy to control the screen grid.
- The LA7696 can be easily used in conjunction with the LA7650, 7680 (under development) series.

Maximum Ratings at Ta = 25°C				unit
Maximum Supply Voltage	V_{20} max		14	V
	V_O max	Pins 15,17,19	14	V
IC Flow-out Current	I_O max	Pins 14,16,18	20	mA
Allowable Power Dissipation	Pd max	Ta≦65°C	770	mW
Operating Temperature	Topr		−10 to +65	°C
Storage Temperature	Tstg		−55 to +125	°C

Operating Conditions at Ta = 25°C			
Recommended Supply Voltage	V_{20}	12	V
Operating Voltage Range	V_{20} op	10 to 13	V

Package Dimensions
(unit : mm)
3021B

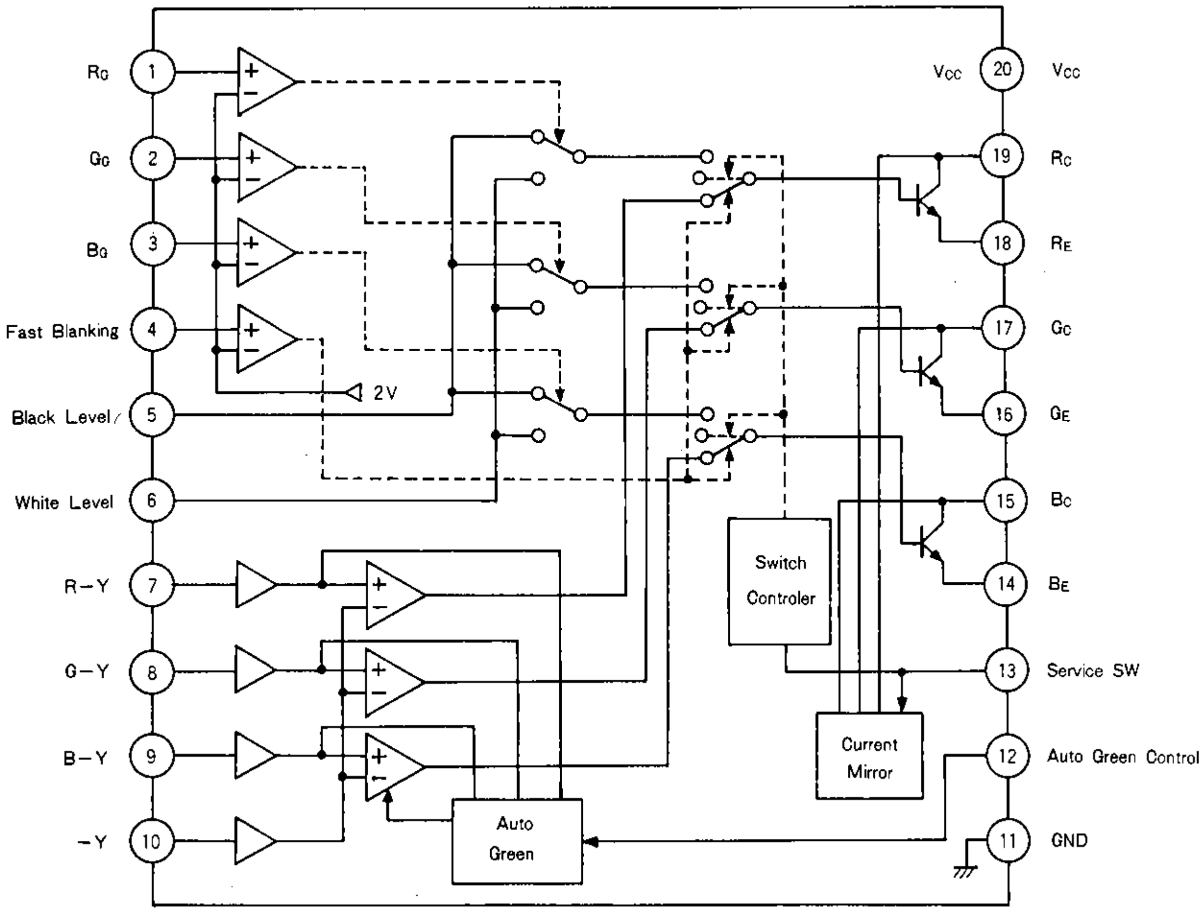


Operating Characteristics at Ta = 25°C, $V_{CC} = V_{20} = 12V$ ※C = R,G,B

			min	typ	max	unit
Output Breakdown Voltage	BV_{CEO}	$I_C = 0.1mA, I_B = 0(V_{13} = 5.0V)$	16			V
Supply Current	$I_{CC}20$		27	35	44	mA
Output DC Voltage	V_{EC}	-Y = 4.0Vdc, C-Y = 5.2Vdc Pin13 : open	4.5	5.0	5.5	V
Output DC Differential Voltage	ΔV_{EC}		−0.2	0	+0.2	V
Service Current	$I_{C\ FACT}$	$V_{13} = 5.0V$			0.1	mA
	$I_{C\ Field}$	Pin 13 : Pulled up to V_{CC} with 2.2kΩ	2.5	2.7	2.9	mA
Graphics Black Level	V_{BLC}	V_{BL} = 4.3Vdc, CG = 0V, FB = 5V	4.5	5.0	5.5	V
Graphics White Level	V_{WLC}	V_{WL} = 5.4Vdc, CG = FB = 5V	5.5	6.0	6.5	V
Gain	G	C-Y = 5.2Vdc, -Y = 3.5Vdc, 1Vp-p, f = 1kHz	0.90	0.95	1.00	
Frequency Characteristics	f-3dB	C-Y = 5.2Vdc, -Y = 3.5Vdc, 1Vp-p	8.0	14.0		MHz
Output Voltage at OFF Mode	$V_{R,G,B}$	C-Y = 5.2Vdc, -Y = 5.0Vdc	4.4	4.5	4.6	V
-Y Distortion Factor	$-Y_{Dist}$	-Y = 3.5Vdc, 1Vp-p, 1kHz C-Y = 5.2Vdc			1	%
C-Y Distortion Factor	$C\text{-}Y_{Dist}$	C-Y = 5.2Vdc, 1Vp-p, 1kHz -Y = 3.5Vdc			1	%
CG&FB Pulse Width	$P_{W\ CGFB}$	FB = CG = 5Vp-o, 250ns, -Y = 4.5Vdc, V_{WL} = 5.9Vdc, C-Y = 5.2Vdc	205	255	305	ns
CG&FB Delay Time	$Td_{\ CGFB}$	"		68	100	ns
FB Pulse Width	$PW_{\ FB}$	FB = 5Vp-o, 250ns, -Y = 2.5Vdc, V_{BL} = 4.3Vdc, C-Y = 5.2Vdc	215	265	315	ns
FB Pulse Width Error	$\Delta PW_{\ FB}$	"	−25	0	+25	ns
FB Delay Time	$Td_{\ FB}$	"		57	100	ns
CG Pulse Width	$PW_{\ CG}$	FB = 5Vdc, CG = 5Vp-o, 250ns V_{WL} = 5.9Vdc, V_{BL} = 3.8Vdc	215	265	315	ns
CG Pulse Width Error	$\Delta PW_{\ CG}$	"	−25	0	+25	ns
CG Delay Time	$Td_{\ CG}$	"		65	100	ns
Maximum Auto-Green	AG max	R-Y = B-Y = 5.2Vdc, G-Y = 6.2Vdc -Y = 2.0Vdc, $V_{12} = 0 \rightarrow 12V$	1.9	2.3	2.7	V
Middle Auto-Green	AG mid	R-Y = B-Y = 5.2Vdc, G-Y = 6.2Vdc -Y = 2.0Vdc, $V_{12} = 0 \rightarrow 8V$	0.9	1.1	1.3	V
Input "H"-Level Voltage	V_{IH}	C-Y = 5.2Vdc, -Y = 4.0Vdc V_{BL} = 5.4V, V_{WL} = 5.9V	2.3			V
Input "L"-Level Voltage	V_{IL}	C-Y = 5.2Vdc, -Y = 4.0Vdc V_{BL} = 5.4V, V_{WL} = 5.9V			0.8	V
V_{CC} Dependence of Output DC Voltage	ΔVout	-Y = 4.0Vdc, C-Y = 5.2Vdc (V_{CC} = 12V)	4.4	9.4	14.4	%/V

Note) Be sure to connect a protection resistor to pins 15, 17, 19 to prevent the IC from breaking down when discharge occurs in the cathode-ray tube.

Block Diagram



Auto Green Function

Basic Operation

When a standard NTSC demodulator is used to demodulate green color, an original green color turns bluish green. The auto green function works to reduce the B-Y component for green color correction so that the original green color can be reproduced faithfully. This correction can be provided in the range shown in Fig.1.

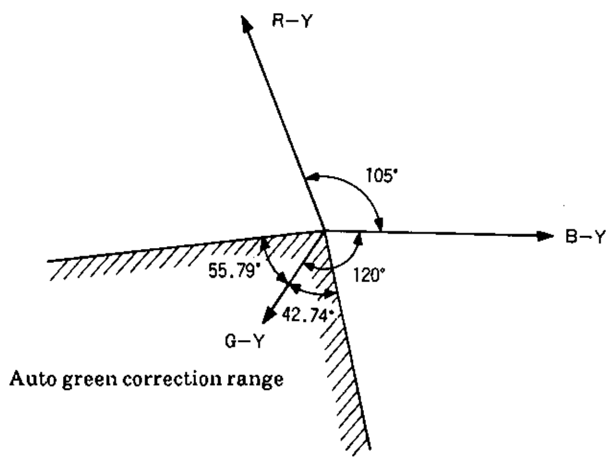


Fig.1 Auto Green Correction Range

The auto green function compares each color difference signal of R-Y, G-Y, B-Y and if the G-Y component is larger than the R-Y, B-Y components the B-Y component is reduced in proportion to the difference between them.

The auto green function is also capable of providing your desired correction by setting the control voltage on pin 12. When the control voltage on pin 12 is changed as 0V→12V, the input signals are changed equivalently as shown in Example 1. Actually, 5.2V offset given to R-Y, G-Y, B-Y with −Y = 4V causes the B output (pin 14 of LA7696) to change as 4.83V→4.64V.

Example 1
Control voltage on pin12

0 V ⟶ 12V

R−Y=−0.212V	Changed	R−Y=−0.212V
G−Y=+0.100V	equivalently	G−Y=+0.100V
B−Y=−0.167V min		B−Y=−0.358V max

If the G-Y component is +0.1V when a color on the G-Y demodulation axis comes, the B output voltage changes with the control voltage on pin 12 as shown in Fig.2. The maximum change is −0.19V.

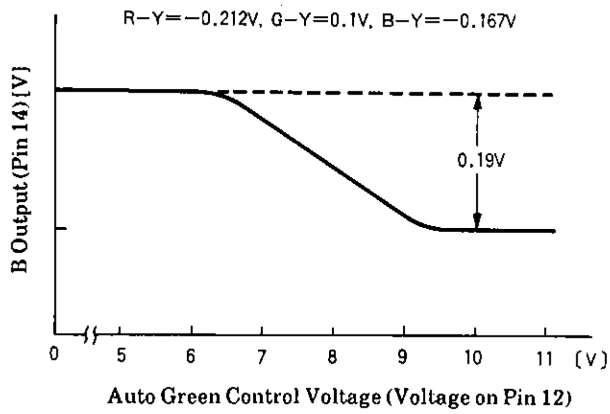


Fig.2. Auto Green Characteristic

Function of the Service Switch
(screen grid voltage adjustment function during white balance adjustment)

The LA7679 output can be switched between the three modes a, b and c described below by the state of pin 13.

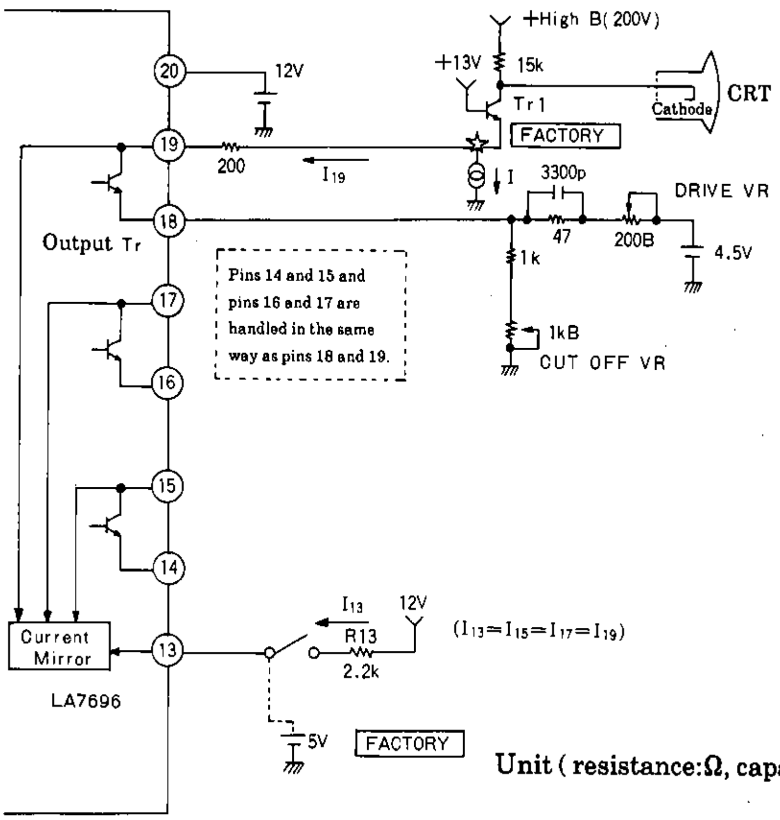
a) Service switch function (for adjustment by a serviceman in the field)
This function is provided to allow the screen grid voltage to be adjusted easily during white balance adjustment.
As shown in Figure 3, when pin 13 is connected to V_{CC} through the resistor R13, the pin 15, 17 and 19 output transistors will be off. At the same time, a current equivalent to the current (I13) flowing in resistor R13 flows into each of the pins 15, 17 and 19. As a result, the CRT cathode potential can be fixed at an arbitrary value by changing R13. Thus the screen grid voltage can be adjusted easily.
The current flowing into pins 15, 17 and 19 is determined by the following formula.

$$I_{15}=I_{17}=I_{19}=I_{13}=\frac{V_{CC}}{2\times R13}$$

Since pin 13 is connected to V_{CC} through a 2.2kΩ resistor, a current of about 2.7mA flows into each pin 15, 17 and 19. If + High B is set to 200V, the CRT cathode is fixed at 160V. The purpose of Tr1 is to protect the IC.

b) Service switch function (for adjustment at the factory)
The pin 15, 17 and 19 currents can be set to 0 (I15=I17=I19=0) by applying 5V (when V_{CC}=12V) to pin 13. In this state the pin 15, 17 and 19 output transistors will be off. Fix the CRT cathode potential by connecting a constant current source to the points (a total of 3 points) indicated with stars in Figure 3, and then adjust the screen grid voltage.
This mode is appropriate for use in the manufacturing process where the TV set is assembled.

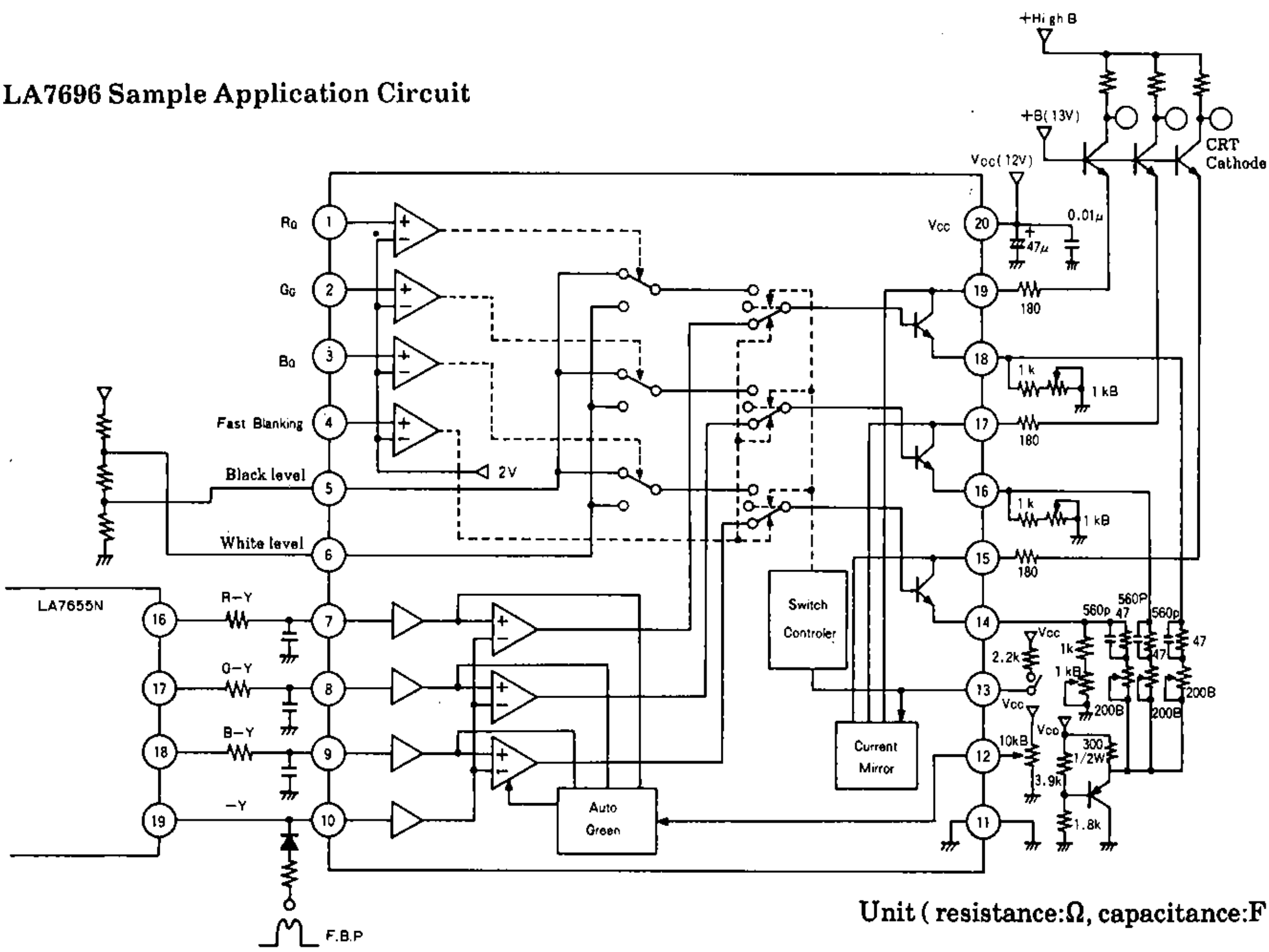
c) Normal operation
When pin 13 is left open, the video signal will be output from pins 15, 17 and 19.



Unit (resistance:Ω, capacitance:F)

Fig.3 Function of the service switch

LA7696 Sample Application Circuit



Unit (resistance:Ω, capacitance:F)